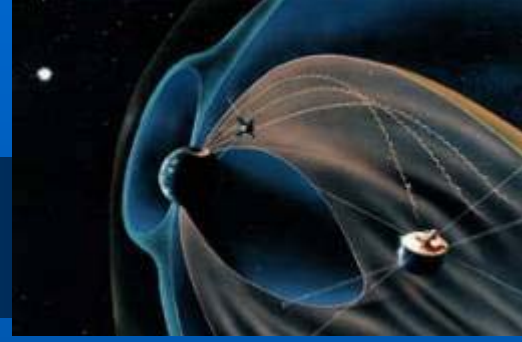


Chinese Updates for ILWS

Z.X Liu and C.Wang

Center for Space Science and Applied Research
Chinese Academy of Sciences

Outline

- Update on DSP
- Update on SWISE and Meridian Project
- New Proposed Space Science Missions
  - Kuaff
  - SMESE
  - SPORT

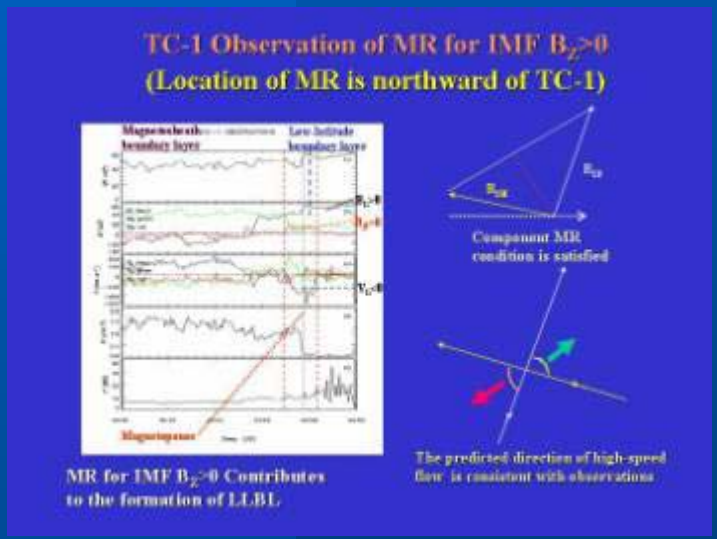
Update on Double Star Project

- The equatorial satellite (TC-1) and the polar satellite (TC-2) were launched successfully in December 2003 and July, 2004, respectively.
- Both satellites operate normally, TC-1 moves through many important magnetospheric regions, such as the bow shock, magnetosheath, low latitude magnetopause boundary layer, radiation belt, ring current , plasmasphere; TC-2 moves through cusp, auroral region, and high latitude region.

Update on Double Star Project

- All payloads work normally, providing high-quality data as expected;
- DSP has very good conjunction with Cluster, forming coordinated and simultaneous exploration in the important magnetospheric active regions:
  - Solar wind-bow shock-magnetosheath-low latitude magnetopause boundary layer
  - Cusp-high latitude boundary layer-auroral region;
  - Plasmasheet and its boundary layer-ring current-radiation belt-plasmasphere

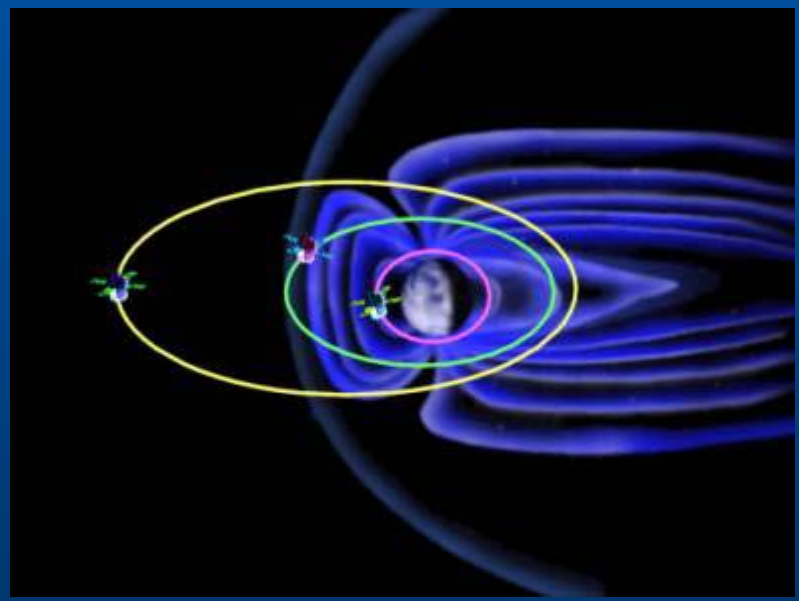
Update on Double Star Project



- The first results of data analysis have already shown great interest.
- Mission extensions of 1.5 years for TC-1 and 1 year for TC-2 are under assessment.

Space Wind and Storms Exploration (SWISE)

Update



The progress status of SWISE phase A

- The scientific objectives have been optimized.
- We consider that the fields, waves, and particles in the ionosphere and low magnetosphere regions may be affected by the inner earth activities (such as earthquake). Therefore, add the inner earth signal exploration in the SWISE scientific objectives, to form the solar wind-magnetosphere-ionosphere-thermosphere-inner earth coordinated exploration system.

Update on SWISE

- The payload scheme, as well as technical demands concern with spacecraft, was confirmed; the primary spacecraft scheme and launch vehicle scheme were proposed;
- The preliminary schedule:
  - May, 2005: finish the Phase A report of SWISE and organize a review meeting;
  - Sept., 2005: organize the review meeting of feasibility of SWISE;
  - June, 2006: initiate SWISE;
  - 2010: Launch

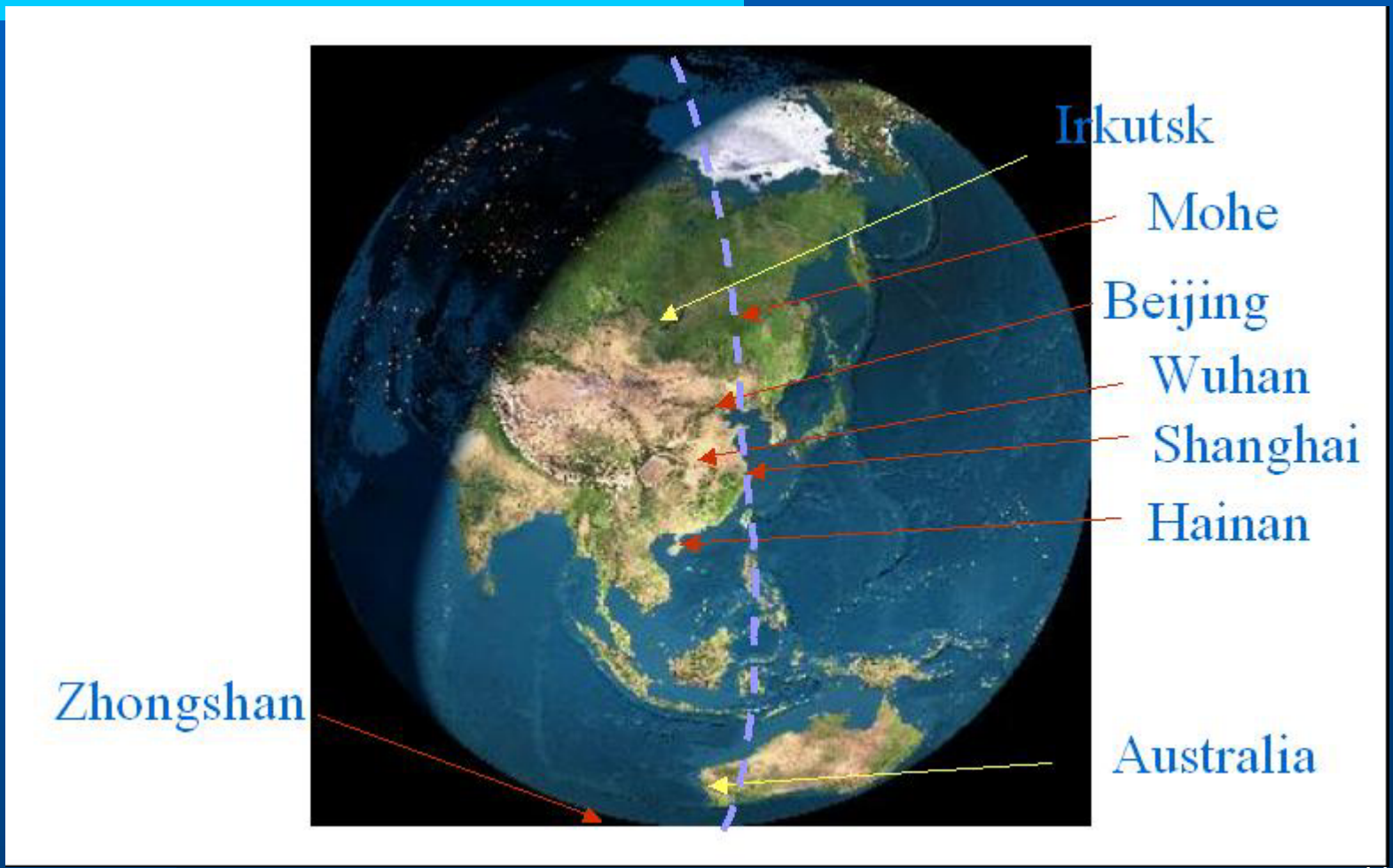
International cooperation of SWISE

- The cooperation of payload:
  - Most PIs of DSP and some PIs of Cluster from Europe and some PIs of ePOP mission from Canada are planning cooperation with SWISE;
- The cooperation of satellite:
  - We are planning to develop the SWISE missions with ESA SWARM missions and ePOP mission of Canada to form a solar wind-magnetosphere-ionosphere-low and high atmosphere – internal Earth coordinated exploration system, to study the influences of solar wind disturbances and inner Earth activities (manly earthquake) to the fields, waves, particles in the ionosphere and low magnetospheric regions.

Meridian Space Weather Monitoring Project (Meridian Project)

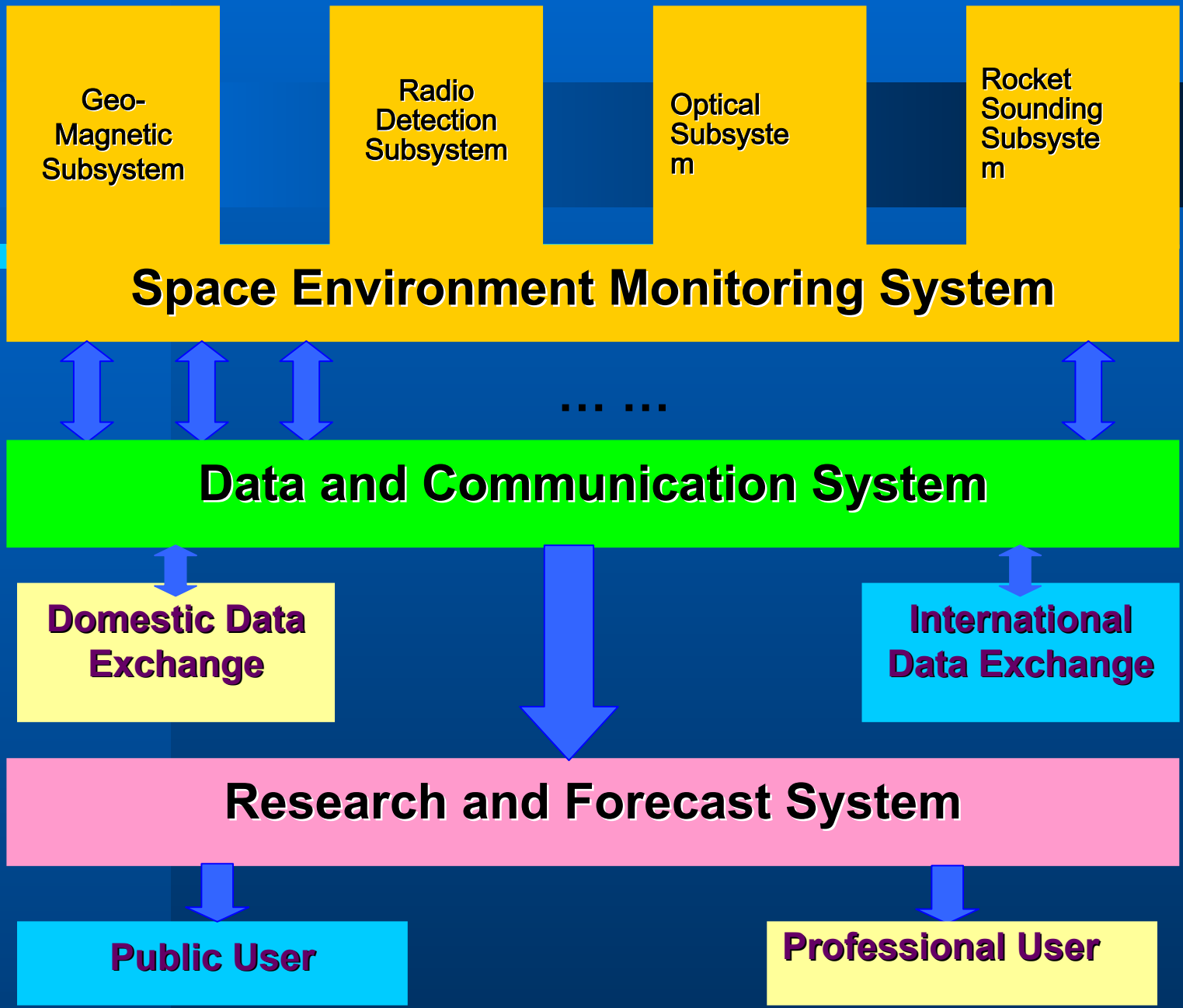
Has been approved !

It is a Chinese multi-station chain along 120ºE to monitor space environment, starting from Mohe, the most northern station in China, through Beijing、 Wuhan、Guangzhou and extended to Chinese Zhongshan station in the Antarctic.



Stations Distribution

Zhongshan Station in Antarctica →


Geo-Magnetic Subsystem
Radio Detection Subsystem
Optical Subsyste m
Rocket Sounding Subsyste m
Space Environment Monitoring System
... ...
Data and Communication System
Domestic Data Exchange
International Data Exchange
Research and Forecast System
Public User
Professional User

Instrument and Facilities

- Magnetometers
- Ionosondes and digisondes
- Incoherent Scattering Radar
- HF back-scattering radar
- VLF receiver
- LIDARS
- Fabry-Perot interferometer
- …

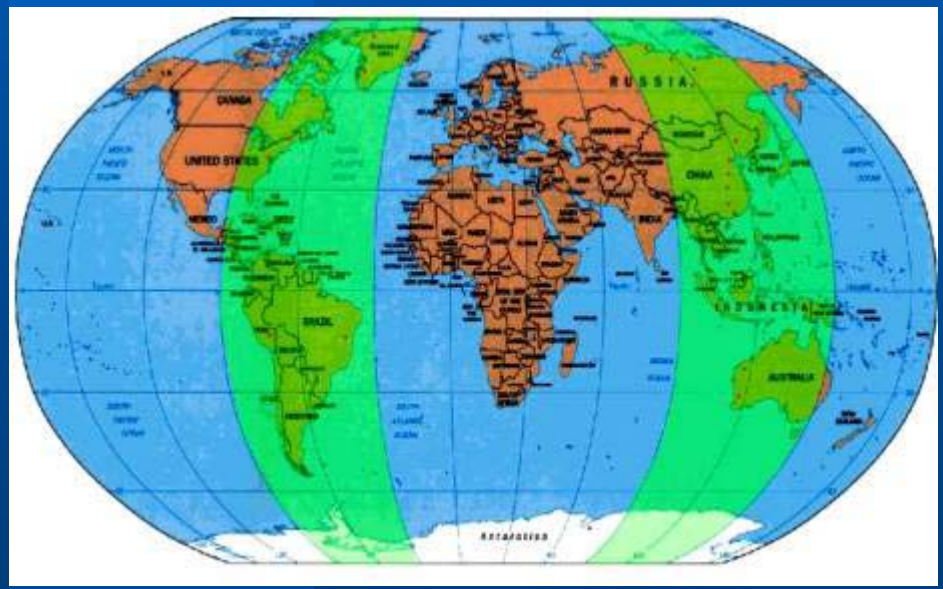
Spatial Coverage

By

The Meridian Project

No.	Station	Lat.	Lon.	Types of Observations
01	Mohe	53.5N	122.4E	Geomagnetic
02	Manzhouli	49.6N	117.4E	Geomagnetic, Ionospheric
03	Harbin	45.5N	126.5E	, Ionospheric
04	Changchun	44.0N	125.2E	Geomagnetic
05	Beijing	40.3N	116.2E	Geomagnetic, Ionospheric, Lidar, MST radar, Optical atmospheric, IPS, Cosmic rays
06	Xinxiang	34.6N	113.6E	Geomagnetic, Ionospheric
07	Wuhan	30.5N	114.6E	Geomagnetic, Ionospheric, Lidar, MST radar
08	Guangzhou	23.1N	113.3E	Geomagnetic, Ionospheric, Cosmic rays
09	Hainan	19.0N	109.8E	Geomagnetic, Ionospheric, Lidar
10	Zhongshan	69.4S	76.4E	Geomagnetic, Ionospheric
11	Shanghai	31.1N	121.2E	Geomagnetic
12	Chongqing	29.5N	106.5E	Geomagnetic, Ionospheric
13	Chengdu	31.0N	103.7E	Geomagnetic, Ionospheric
14	Qujing	25.6N	103.8E	Incoherent Scattering Radar (ISR)
15	Lhasa	29.6N	91.0E	Geomagnetic, Ionospheric

International Collaboration



The International Space Weather Meridian Circle Program (ISWMCP), proposal to connect 120°E and 60°W meridian chains of ground based monitors and enhance the ability of monitoring space environment worldwide.

Collaboration Proposal: Extending the MP into Russia

Name of station	Geographic		L	Types of observations
	Latitude	Longitude		
Norilsk	69.4	88.4	5.6	Ionospheric, magnetic, cosmic rays, optical atmospheric
Patrony	52.2	104.5	2.2	Magnetic
Mondy	51.6	100.8	2.1	Solar optical, magnetic, cosmic rays
Uzur	53.3	107.7	2.3	Magnetic, ionospheric
Badary	51.5	102.3	2.1	Radio solar
Tory	51.5	103.0	2.1	Radio ionospheric, optical atmospheric
Listvyanka	51.8	104.9	2.1	Solar optical
Irkutsk Radar	52.9	103.3	2.2	Ionospheric (incoherent scattering)

New Proposed Space Science Missions

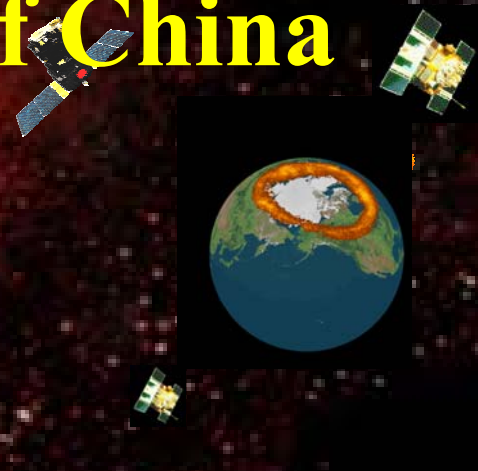
Solar Terrestrial Disturbance Monitor

‘ KuaFu’ mission(Quaff)

Space Weather Explore

‘ KuaFu’ mission (Quaff)

Pre- study is supported by the National NSF of China



SUMER image

Team member for the pre-study

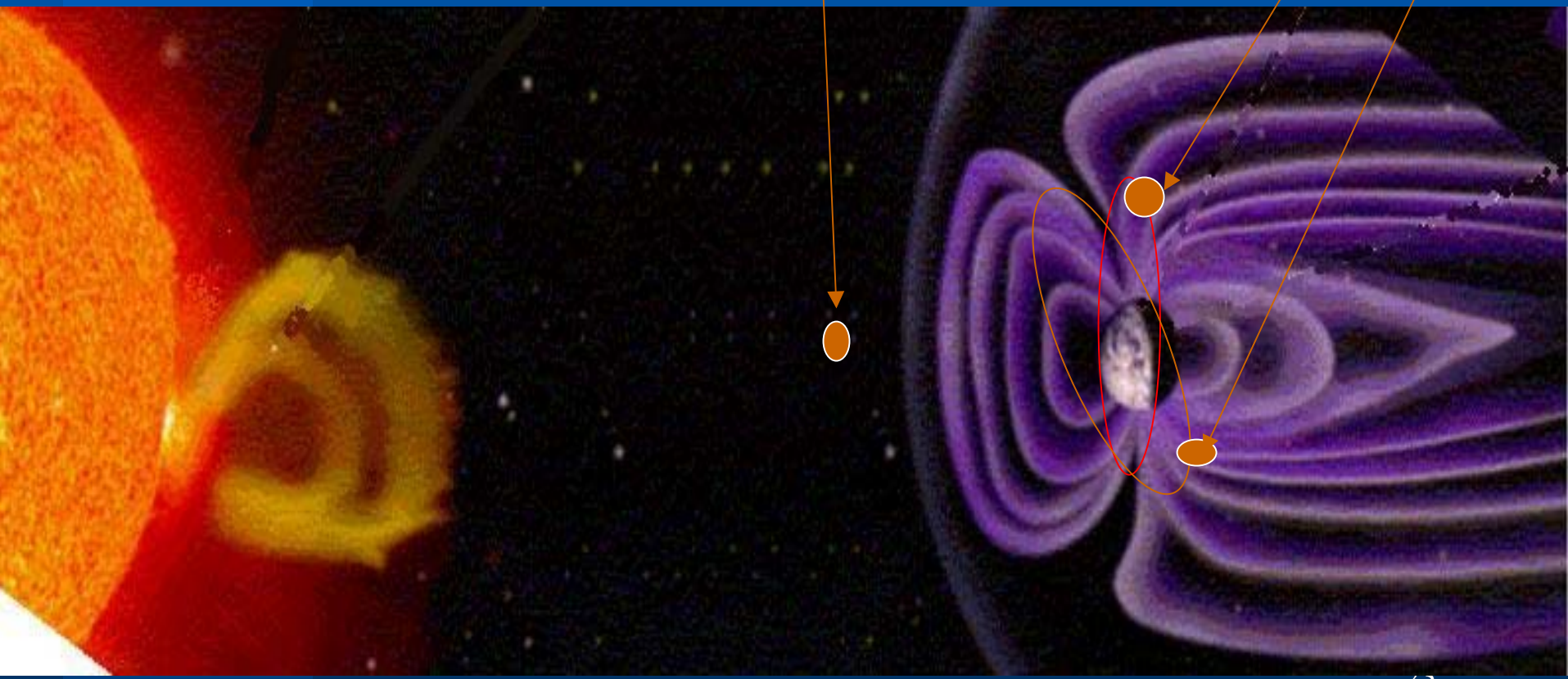
- **C.-Y. Tu** Peking University China
- **Y.-W. Zhang** China Academy of Space Technology
- **R. Schwenn** MPS Germany
- **E. Donovan** U. of Calgary Canada
- F-S. Wei; Z. Xiao; Wang J.-S. ;L.-D. Xia ; S.-G., Yuan
- E. Marsch, P. Lamy , P. Rochus , C. Jamar, and others.

Brief Description

KuaFu Mission 2012-2015

KuaFu-A at L1

KuaFu-B1+2: Polar



SOHO image

KuaFu-A at L1

Solar EUV emission
White light CME
Radio wave measurement
local plasma and magnetic field
High energy particles

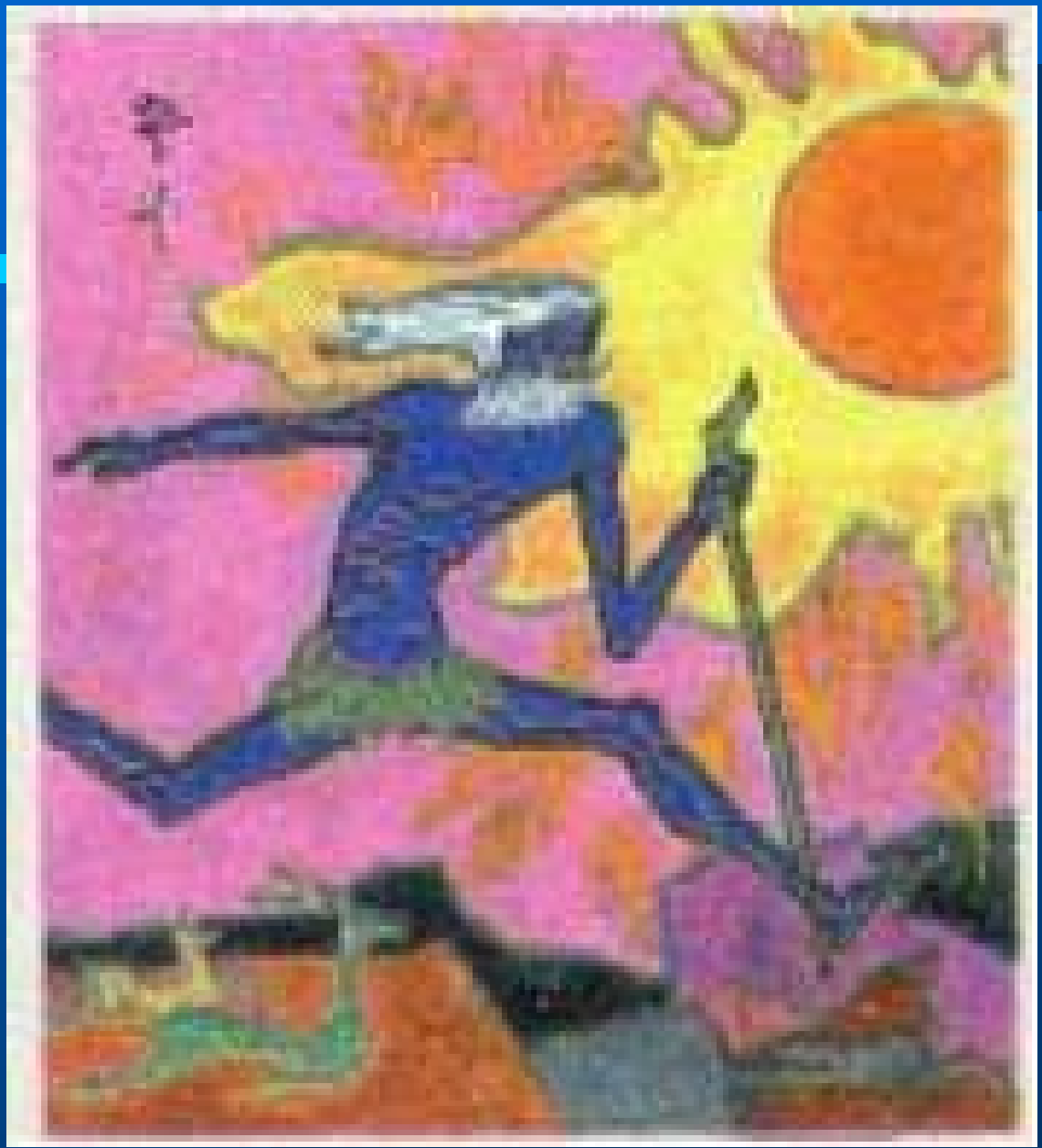
KuaFu-B1+B2 polar orbit

24 hours Aurora Image,
Magnetic field
High energy particles

Scientific Objectives

To observe the complete chain of disturbance from the solar atmosphere to the geo-space:

- Solar flares, CMEs,
- Interplanetary clouds, shock waves,
- Their geo-effectiveness, such as sub-storms and magnetic storms, aurora activities



Mr. Quaff

An ancient folk of China:

A man named Quaff died on his way to pursue after the Sun

Published on Sept 25th,1987,and by Beijing Stamp Printery.

Small Explorer for Solar Eruptions

(SMESE)

SMESE —

Small Explorer for Solar Eruptions

Purple Mountain Observatory, CAS, China
Nanjing University, China
Center for Space Science and Applied Research, CAS, China
National Astronomical Observatory, CAS, China
Institut d'Astrophysique Spatiale,CNRS, France
Observatoire de Paris, France
Max-Planck-Institute For solar System Research, Germany

October 3-5, 2004

Brief description

1 Abstract

SMESE: **to observe the solar flares and CMEs for the next Solar Maximum**

Main Scientific Objectives:

to establish the interconnections between flares and CMEs; to follow the disc source region of CME; to diagnose the high energy particles accelerated by flares and CMEs; to study the energy transportation mechanisms

— all of these are the key ingredients of space weather!

Instrumentation:

- Lyman-alpha disc imager (up to 1.15R¤)
- EUV (FeXII 19.5 nm) disc imager
- Infrared telescope (35 & 150 μm)
- Lyman-alpha coronograph (1.1-2.5R¤)
- X-ray spectrometer (10-300 keV)
- Gamma-ray spectrometer (0.2-600 MeV)

Predominance:

- the first space inner corona obs. in Ly-α
- the first space solar infrared observation
- the first flare-CME interconnected observation

2 Schedule

- 2004-2005: phase-A study
- 2005-2006: phase-B
- 2006-2008: phase-C, D
- 2009-2010: launch
- Up to 2 years delay is still acceptable.

3 Collaborators

China: Purple Mountain Obs., CAS

Nanjing University

CSSAR, CAS

National Astron. Obs., CAS….

France: Institut d'Astrophysique Spatiale,CNRS

Observatoire de Paris

Laboratoire d'Astrophysique de Marseille…

Germany: MPI of Solar System Research

Belgium: CSL, Liège; ROB, Bruxelles

Other potential partners:

RAL/MSSL/UB, UK; UT, UF, Italy;

Paul Scherrer Inst., Switz.; UO, Norway…

4 Coordinators:

Chinese side:

Fang, C. (Nanjing Uni., Academician of CAS, IAU vice president): **PI**

Gan, W.Q. (PMO, CAS): **Sci. & organization**

European side:

Vial, J.,-C.(IAS, France): **PI**

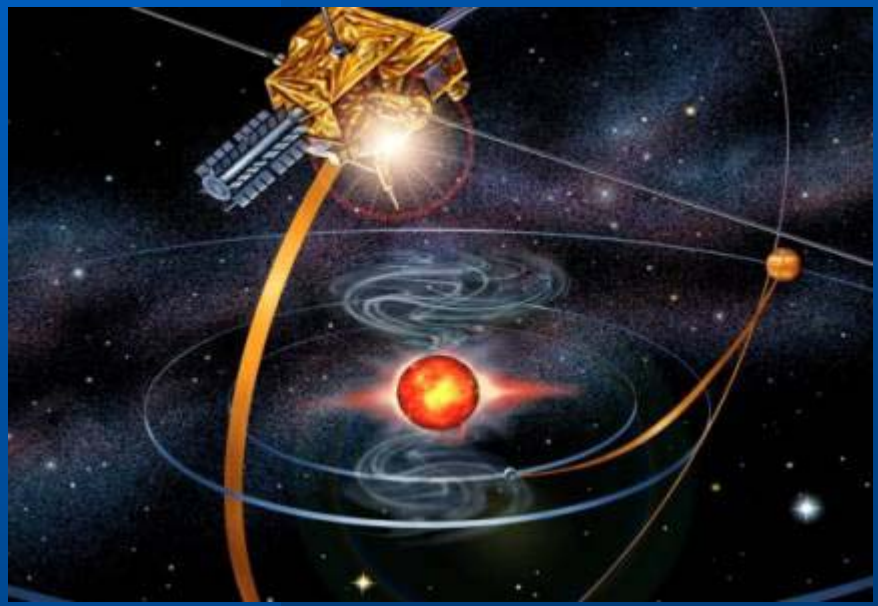
Solanki, S. (MPI, Germany):**Sci. & Instru.**

Delaboudinière, J,-P. (IAS, France): **Sci. & Instru.**

Trottet, G. (Meudon, France): **Sci. & Instru.**

Solar Polar Orbit Radio Telescope (SPORT)

Orbit



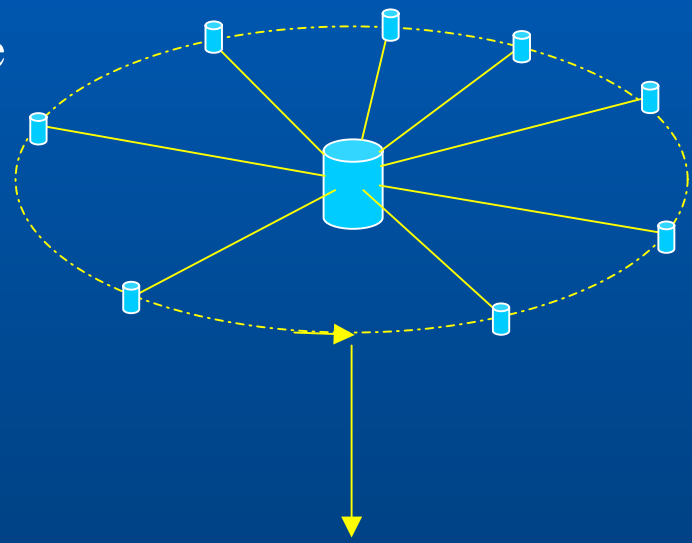
Ulysses Orbit

Solar Orbit with high inclination，0.5-1.5AU，Viewing field covers the interplanetary space ranging from 0.2(50Rs) to 1AU

SPORT Satellites

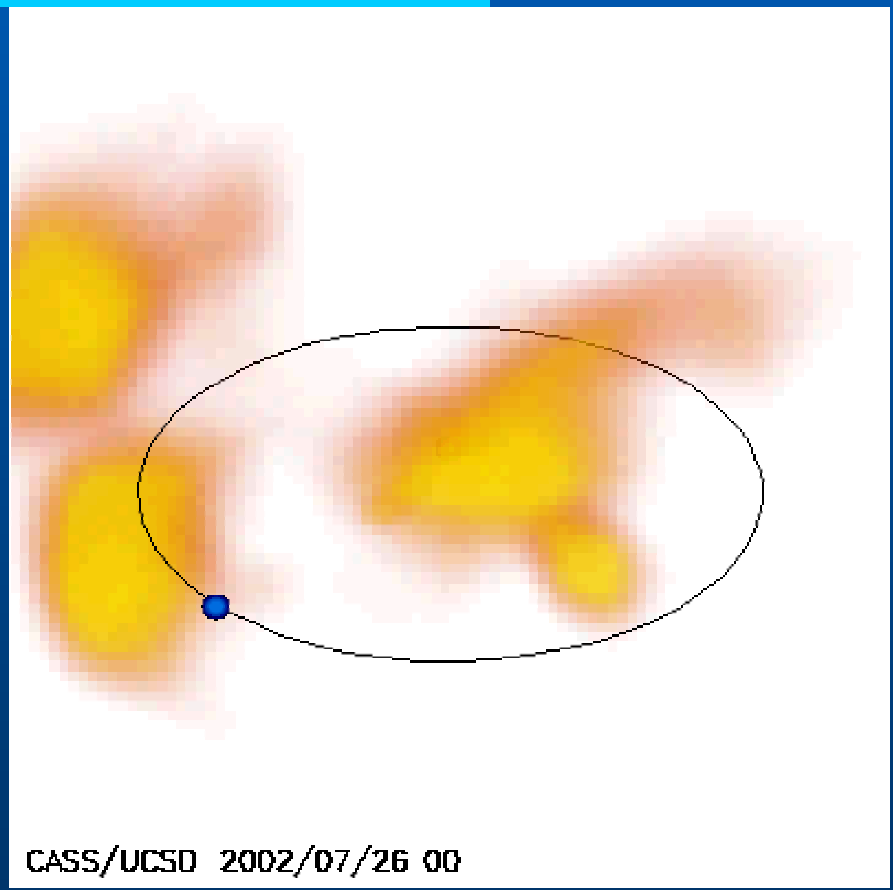
The satellite will consist of the mother satellite and rotating small children satellites. The mother satellite is responsible for communication with Earth and control of the children satellites. The rotating children satellites provide the baseline of the antenna.

- **Payloads: radio/HF/microwave imager, EUV imager, etc.**
- **Resolution requirements: due to limitation of date rate, spatial resolution of image should not be too high, within 1 AU 100-400 cells or within 5 solar radius 100-400 is good enough.**



The Sun

Numerical Simulation



Scientific Goal

- To track the propagation of the interplanetary CME using microwave remote sensing technique from a out-of-ecliptic perspective.

- To provide plasma cloud map in an attempt to better serve space weather forecast.


THANK
YOU